SWISS TURNING PROCESSES

The world medical market is strong for several reasons, including the fact that it has an aging population.

Beyond the growing demand for healthcare, the rising costs of healthcare are another reason why the medical sector is an attractive new business arena for those involved in manufacturing. Insurers and healthcare providers are creating pressure to reduce costs by increasing productivity – and this spells opportunity for manufacturers of innovative medical parts and devices.

How does Swiss turning fit in?

There are several diverse segments to the medical sector and all of these can be served using the Swiss turning machining process. Interventional cardiology devices, orthopedic devices (bone screws, implants, and joint replacement), minimally invasive surgical devices and equipment and dental (equipment and implants) segments all have parts that can be efficiently and profitably machined on a Swiss turning center.

Micro machining

Micro machining, another type of Swiss turning useful for medical parts, requires a proper mindset in terms of part and

tool handling, inspection, and secondary operations. When micro machining medical parts, there are a few musts:

1. Machine accuracy: even with the best tooling, if your position locations are not accurate, you are fighting a losing battle. It is important to re-qualify your tool positions and update the database.

2. Run-out: run-out that might seem fine for a standard size part could likely spell disaster in micro machining Main / pickoff collets and guidebush need to be "XP" – extra precision. And ER style collets need "UP" – ultra precision.

3. High frequency spindles: essential for drilling or milling tiny features into parts and achieving the desired finishes, accuracy and tool life. For example, drilling a 0.2 mm hole in stainless, you will need 11,500 rpm. But if the tool is TiN coated (Titanium nitride – a hard ceramic material often used as a non-toxic exterior for medical implants), you need 19,000 rpm. Some spindles (such as those from IBAG, NSK, Meyrat and others) can reach speeds in excess of 150K. Spindles can be mounted various ways in the machine to meet specific needs.

These parts include features created with high frequency spindles and spindles that are mounted in holders.

Internal Broaching

Another key machining process for medical parts manufacture is internal broaching. It's important to purchase the proper broaching tools. But how is the actual broaching process completed?

1. In preparation for the broaching process, it is necessary to make a pilot hole.

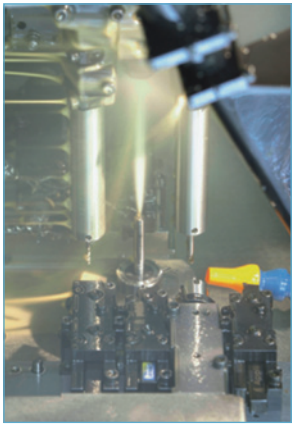
2. Depending on the configuration, it may be necessary to remove material for the corners with a small endmill.

3. A 90° chamfer on the hole is also necessary. This prevents the points from chipping upon entering the cut. It also allows the broach to follow the centerline.

4. Depending on the chip size, deburring passes may be required.

Rotary Broaching

Wobble (or rotary) broaching uses a tool with a similar shape to the final shape except that it is ground with clearance. The tool axis is typically inclined 1° from the work axis.



As the broach rotates, it is pressed against the work. Due to the 1° incline, the leading edge of the tool "wobbles" with respect to the work. Tornos offers these guidelines:

1. If the tool is inclined 1°, the sides of the tool must have a clearance angle of at least 1°.

2. Ideally, the tool advances at the same rate

it cuts. For example, a ½" diameter tool should advance at 0.022 per rev. (1/2 x sin (1°) = feed.

3. In general, wobble broaches does not cut as accurately as the punch broach so its use should be determined by the application.

Thread Whirling

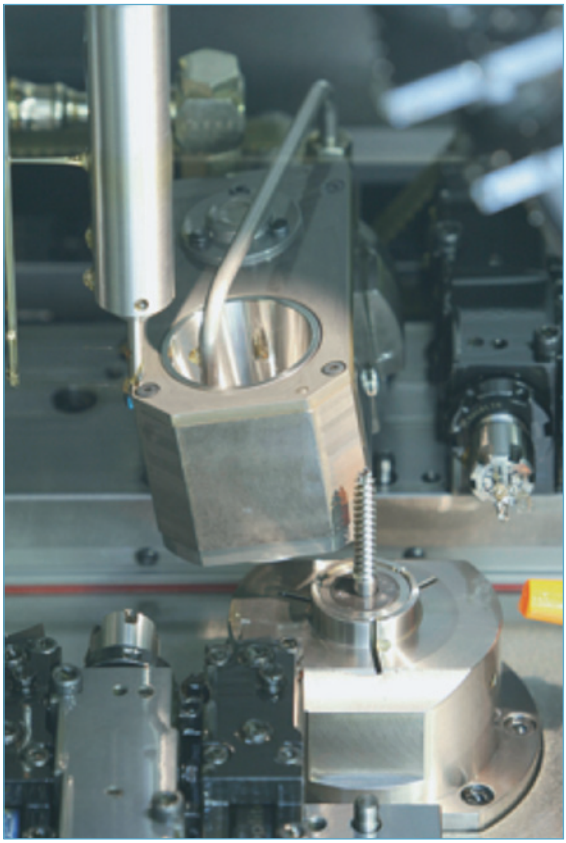
Thread whirling, a technique pioneered by Tornos, is generally used for cutting special form threads in difficult-to-machine materials with far fewer limitations than other thread cutting options. Thread whirling is often used for bone screws due to their typical challenges: long length to diameter ratio ; deep, high helix buttress thread forms ; and extreme differences between major and minor diameters. ID thread whirling is great for producing clean, burr-free thread contours. No residual chips are created. And it's possible to thread right to the bottom of a hole. Thread whirling can produce threads as small as M1.4.

Alternatives to thread whirling include: die head (which doesn't work with materials like titanium; thread milling (which requires pre-turning, special cutters, and in some cases, special supports; single point turning (good for short screws – but long screws need support), thread rolling (which requires accu-rate pre-turning and doesn't work on "buttress" style threads of hard materials), and grinding (which can't be done on a Swiss turning machine).

Some special considerations with thread whirling:

1. The circular inserts used in a thread whirler are custom ground. If a customer does not have the means or desire to re-sharpen the circular inserts, they can opt for a cutter head that uses indexable inserts.

2. The setting gauge locates inserts at the proper angle prior to locking them into the head.



3. The cutter head is mounted into the thread whirling unit.

4. The thread whirling unit is mounted in the machine at the proper helix angle by means of a graduated scale.

5. Tools rotate at very high speeds.

6. Part rotation depends on left hand or right hand threads.

Gun drilling

Cannulated (or hollow) bone screws contain a space that allows bone marrow to grow and facilitates the insertion of guide pins for bone screws used in fracture fixation. With increases in cannulated bone screw orders, many shops are purchasing cannulated material.

An alternative is gun drilling which allows these types of medical screws to be made efficiently from solid bar stock with:

1. High drilling quality.
2. Great chip removal.
3. High process.
4. Minimum run out.
5. Great length to diameter ratio.

Partner

Tornos specialises in the manufacture of machines designed to produce parts requiring extreme precision and quality. The company has a worldwide sales and services network.

The company develops, manufactures and sells single-spindle and multispindle automatic turning machines and machining centres for small parts, as well as their associated products and services.

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